severe LV systolic dysfunction (EF ≤ 35%). All pts (57 ± 9 yrs, mean EF = 25 ± 7%) underwent clinical examination, Echo-Doppler study and phenylephrine test to assess BRS. The following variables were considered: age, NYHA class, LVEF, transmitral peak E and peak A velocity, E/A ratio, deceleration time of E wave (DT), left atrial size (LA), severity of mitral regurgitation (MR) and BRS.

A depressed (< 3.0 ms/mmHg) BRS was found in 68 pts (49%) (Group 1), while the remaining 70 pts (Group 2) had BRS > 3.0 ms/mmHg. The correlations between NYHA class, LVEF, transmitral Doppler variables, LA, MR and BRS, although significant ($p < 0.001$), were weak (r ranging from 0.31 to 0.44). At univariate analysis, (except for age, peak A and the presence of severe MR), NYHA class and all other Echo-Doppler variables were predictive of depressed BRS. Pts in Group 1, as compared to Group 2, were in a worse functional class (NYHA III–IV 72% vs 28%) and had a significantly lower EF (21 ± 6% vs 28 ± 7%, $p < 0.0001$), a higher peak E (90 ± 29 cm/s vs 70 ± 25 cm/s, $p < 0.0001$) and E/A ratio (2.2 ± 1.5 vs 1.5 ± 1.0, $p < 0.001$), a shorter DT (135 ± 40 ms vs 176 ± 54 ms, $p < 0.0001$) and a larger LA (25 ± 6 cm^2 vs 20 ± 6 cm^2, $p < 0.001$). However, at logistic stepwise regression analysis, only DT < 140 ms (Chi-square 29, $p < 0.001$), NYHA class III–IV (Chi-square 42, $p < 0.001$), and EF < 25% (Chi-square 46, $p < 0.05$) emerged as independent and additional predictors of abnormal BRS.

In conclusion: a short DT, as an index of restrictive physiology dysfunction, is a powerful independent predictor of depressed BRS in CHF patients.

1084-143 Experience with an Implantable Hemodynamic Monitor in the Long-term Assessment of Congestive Heart Failure

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An implantable hemodynamic monitor capable of long-term monitoring of heart rate, RV pressure, RV oxygen saturation (O_2 SAT), and patient (pt) activity levels has been placed in 20 pts aged 26–81 years with severe left ventricular dysfunction (mean EF = 21 ± 5%). Pts have been assessed with telemetry every 2–4 weeks for 12 ± 3 months since implant. The following patterns have been observed:

(1) A pattern of gradual deterioration demonstrating a progressive rise in heart rate, RV systolic/diastolic pressure and estimated pulmonary artery diastolic pressure (ePAD), with a decline in dP/dt. This correlated with fluid retention and improvement following diuresis.
(2) A long period of clinical stability correlated with stable readings from the sensors.
(3) Severe pump failure was indicated by falling systolic and rising diastolic pressure, with a declining O_2 SAT, ePAD, dP/dt, and rising heart rate.
(4) Significant oscillations over several weeks in RV pressure readings have been associated with episodes of clinical deterioration.
(5) Expected hemodynamic changes have been observed during atrial fibrillation, pericardial effusion, and flash pulmonary edema.

Conclusion: Implantable hemodynamic monitors can provide useful corroborative data in the assessment of pts with heart failure. Such devices may be helpful in predicting clinical deterioration and guiding therapy.

1084-144 N-terminal proatrial natriuretic factor: relation to long-term prognosis in patients with idiopathic heart failure

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N-terminal proatrial natriuretic factor (proANF) has the advantage of being more stable and having a longer half-life than ANF (99–126). ProANF has previously been associated with prognosis in congestive heart failure (CHF) secondary to coronary artery disease in selected study populations. However, the importance of this hormone in a larger population of unselected CHF is not known. To relate proANF to survival and clinical findings we investigated a group of patients with idiopathic CHF (n = 175), recruited from the world's largest unselected CHF population (n = 2711). The patients were investigated by echocardiography. Seven-year survival data was available for all patients. Normal plasma levels were assessed in 134 healthy subjects. *Results:* ProANF was significantly correlated to several clinical, biochemical and echocardiographic variables expressing CHF. In a multivariate Cox proportional hazard analysis proANF ($p = 0.002$), serum sodium ($p = 0.02$), NYHA class ($p = 0.001$), left ventricular mass ($p = 0.0003$), and blood pressure ($p = 0.03$) were significantly and independently correlated to mortality. Odds ratio for proANF/100 (pmol/l) to predict mortality was 1.027 (95% CI 1.009–1.045). In a stepwise logistic multivariate analysis four variables were independently correlated to proANF: modified Boston criteria ($p < 0.0001$), left atrial diameter ($p = 0.01$), serum sodium ($p = 0.02$), and left ventricular mass ($p = 0.0003$). Also patients in NYHA class I and patients with normal ejection fraction and diastolic dysfunction had significantly higher proANF as compared with the controls. *Conclusion:* ProANF was correlated to several clinical and echocardiographic variables and furthermore to long-term survival (7 years). Thus, proANF might be a valuable tool to assess prognosis and clinical function in patients with CHF.

1084-145 Force-frequency Relationship in Normal Subjects and in Patients with Heart Failure

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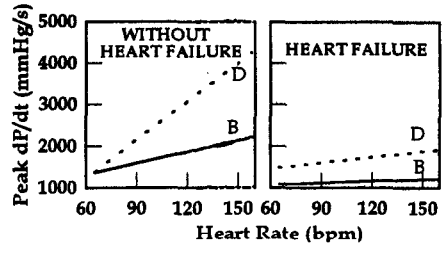
Studies of myocardium obtained from explanted hearts and during cardiac surgery in patients without heart failure (HF) have shown that HF depresses, or reverses the normal force frequency relation and its potentiation by adrenergic stimulation. This observation has been confirmed in animal models of HF, but not in patients. Impaired contractile response to increasing heart rate may contribute to exercise intolerance in clinical HF. We therefore studied 3 subjects free from HF or coronary disease and 5 with dilated cardiomyopathy, 2 idiopathic and 3 secondary to coronary disease but in whom ischemia was ruled out by stress imaging. We incrementally paced the atrium until AV conduction slowed, before (B) and during (D) dobutamine infusion and measured heart rate, LV pressure and dP/dt and cardiac output. The averaged regression lines before and during dobutamine are shown in the figure. In both groups LV end diastolic pressure declined as heart rate increased. HF blunted the effect of heart rate on min dP/dt, but after dobutamine min dP/dt, in contradistinction to max dP/dt, improved. The effect of heart rate on cardiac output did not differ between the groups. Contractility response to heart rate is impaired in clinical heart failure, but we found no difference between groups in the hemodynamic response to pacing.



Further studies are needed to assess the clinical significance of impairment of the force frequency relation.

1084-146 The Involvement Apoptosis in a Variety of Diseases Which Cause Left Ventricular Dysfunction

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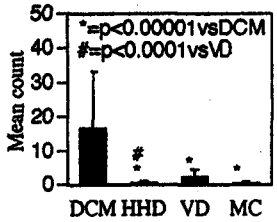
To determine the relationship between left ventricular dysfunction (LVD) and apoptosis, we examined left ventricular endomyocardial biopsy specimens sampled in 18 pts. with dilated cardiomyopathy (DCM), 12 pts. with myocarditis (MC), 7 pts. with hypertensive heart disease (HHD), and 6 pts. with valvular regurgitation disease (VD) who had LVD of less than 0.55 in ejection fraction. The expression of apoptosis was estimated, using immunofluorescence-stained endomyocardial specimens (TUNEL method). The number of positive stained cell per 10 different high power fields (×400) randomly selected was counted.

As shown in the graph, the number of apoptosis positive cell in DCM was greater than that in other disease, and the number in VD was more than that in HHD.



These results suggest that apoptosis could be closely related to DCM, so that the deteorilational process of DCM would be different from those of the other cardiac diseases. In case of hemodynamic overload, apoptosis might be related to volume overloading rather than pressure overloading.